

REMARKS

By the present amendment, claims 64, 65 and 67 are canceled. Claims 68-70 are new and further specify that the compositions of claims 29 and 46 and the method of claim 62 to compositions (application mixtures) contain no effective amount of an organic solvent. Support for claims 68-70 is provided by paragraph [0142] and throughout the Examples of the application (with all references to Publication Number US 2005/0026781 A1 ("US '781")).

Claims 29, 32, 36, 43, 44, 46, 49 and 50 are amended by replacing each occurrence of the parenthetical expression "(acid equivalent basis)" with "on an acid equivalent basis."

Claims 29 and 46 are amended to provide an upper limit of the ratio of glyphosate to pyridine analog herbicide to 20:1. Support is provided by claim 36 that provides an upper limit for said ratio of 20:1.

Claims 29-32, 36-39, 43, 44, 46-53, 59, 62, 63, 66 and 68-70 are pending.

I. Non-Statutory Obviousness-Type Double Patenting Rejections

Applicants note that the provisional obviousness-type double patenting rejections over co-pending applications 11/368,872, 11/227,577 and 11/438,573 have been maintained in the instant Office action. The merits of the rejections will be addressed at such time when the present application is indicated to contain allowable subject matter.

II. Rejection Under 35 USC §112

Claims 29-44, 46-51, 64, 65 and 67 are rejected under 35 USC §112, the Office asserting that the parenthetical expression

"(acid equivalent basis)" is indefinite because it is unclear if the phrase is limiting.

Applicants have amended claims 29, 32, 36, 43, 44, 46, 49 and 50 by replacing each occurrence of the parenthetical expression "(acid equivalent basis)" with "on an acid equivalent basis" in order to clearly indicate that the associated glyphosate and pyridine analog herbicide concentrations are expressed on an acid equivalent basis. Claim 67 is canceled rendering the associated rejection moot.

Withdrawal of the rejection under 35 USC §112 is requested in view of the present amendment.

III. Rejection Under 35 USC §103

Pending claims 29-32, 36-39, 43, 44, 46-53, 59, 62, 63 and 66 stand rejected under 35 USC §103(a) as being obvious over Hacker et al. (US 6,677,276 B1) in combination with Brigance (US 2002/0155953 A1) and Jimoh (US 2003/0004063 A1).

Applicants respectfully submit that the Office has failed to establish a *prima facie* case of obviousness, and claims 29-32, 36-39, 43, 44, 46-53, 59, 62, 63 and 66, are non-obvious over Hacker in combination with Brigance and Jimoh.

A. The state of the art as of the instant priority date

As explained in the Declaration of Dr. Daniel R. Wright, submitted herewith, it was well known to those skilled in the art as of the 22 April 2003 priority date of the present application that certain herbicides such as auxin herbicides, substituted urea herbicides and phenoxy herbicides are antagonistic to glyphosate and can reduce glyphosate efficacy in herbicide co-formulation compositions.¹ The presently claimed

¹ See the Wright Declaration at page 9, paragraph F.1.(c) and Declaration Exhibit 2.

pyridine analog herbicides triclopyr, clopyralid, fluroxypyr and picloram are each classified as auxin herbicides.²

As explained by Dr. Wright, herbicidal efficacy associated with combinations of herbicide species from two herbicide classes (e.g., glyphosate and a pyridine analog) is unpredictable and biological incompatibility frequently occurs.³ The cited Hacker patent acknowledges that unpredictability at column 1:45-49 stating that "phenomena of physical and biological incompatibility, for example lacking stability of a coformulation, decomposition of an active ingredient or antagonism of the active ingredients, occur not infrequently when using several active ingredients in combination."⁴ Dr. Wright further opined that because of the unpredictability in the art and in view of the common general knowledge in the art regarding antagonism, experimental evidence is typically required to support a broad allegation of synergy resulting from the combination of herbicides from two or more classes of herbicides.⁵

B. The present invention

Glyphosate is very effective in killing or controlling the growth of unwanted plants. However, glyphosate uptake (i.e., absorption) by the plant and translocation through the plant is relatively slow. Thus, visual symptoms that a plant has been treated with glyphosate may not appear until one week or more after application to the plant. See the specification at page 1, lines 14-25.

² See the Wright Declaration at page 10, paragraph F.1.(c)(i) and Declaration Exhibit 3.

³ See the Wright Declaration at page 9, paragraph F.1.(a).

⁴ See Hacker (US 6,677,276 B1) at column 1:45-49.

⁵ See the Wright Declaration at page 15, paragraph H.1.(c).

The problem solution of the present invention is directed to combining a pyridine analog herbicide (or a salt or ester thereof) with glyphosate (or a salt or ester thereof), wherein glyphosate is in excess at a ratio of 7.6:1 to about 20:1⁶ (claim 29) or, most broadly, 7:1 to about 20:1 (claim 46) in order to achieve one of the objects of the present invention of achieving both early symptoms of plant treatment (associated with the pyridine analog herbicide) and prolonged control of the plant (associated with glyphosate) (see the specification at page 1, lines 6-13, and page 12, lines 2-8). Early symptoms of plant treatment are visible in 4 days or less after treatment (see the specification at page 19, lines 5-9). Problematically, as explained in the Declaration of Dr. Wright (see above), the prior art teaches that pyridine analog herbicides can be antagonistic and can reduce the herbicidal activity of glyphosate or a herbicidal derivative thereof.⁷

In accordance with the present invention, it has been discovered that combining glyphosate in a weight percent acid equivalent ("a.e.") excess over the pyridine analog herbicide overcomes the antagonism problem and provides enhanced early symptoms of herbicidal efficacy for the combination of herbicides as compared to what would be expected from the additive effect of the herbicides individually applied. The present invention therefore allows for early plant kill in the absence of glyphosate-pyridine analog herbicide antagonism, or increased herbicidal efficacy and lower herbicide application rates for the claimed combination as compared to the herbicides applied individually. Lower herbicide application rates result in cost savings and less unwanted environmental exposure.

⁶ Glyphosate and pyridine analog concentrations expressed on an acid equivalent basis.

⁷ See also the specification at page 19, lines 10-12.

As made of record in the Office action response filed October 23, 2008, Applicants have discovered that the claimed co-herbicide combination provides enhanced early symptoms of herbicidal efficacy.

As further explained in the Declaration of Dr. Wright, the experimental results of the present application show that glyphosate and pyridine analog herbicides are not antagonistic to plant control when co-formulated in weight percent excess glyphosate, and the highest plant control is achieved when the weight ratio of glyphosate to pyridine analog exceeds 6.7:1.⁸

As further explained by Dr. Wright, the experimental results were analyzed for the absence of antagonism or presence of synergism by the Colby method where the expected efficacy for a herbicide combination is calculated from the efficacy of those herbicides applied individually. The expected efficacy was compared to an actual efficacy obtained for the herbicides applied in combination at the same rate as applied individually. A lack of antagonism (i.e., an additive effect) was shown where the actual efficacy for an herbicide combination was approximately equal to the expected efficacy and a synergistic effect was shown where the actual efficacy was greater than the expected efficacy.⁹ To provide a consistent comparative basis, the analysis was restricted to experimental examples having approximately equal application rates of glyphosate and pyridine analog, both individually and in combination; the results reported in Tables 3.2A, 3.2B and 4.4.1 meet that criteria.¹⁰

⁸ See the Wright Declaration at pages 3-8, section E.

⁹ See the Wright Declaration at page 4, paragraph E.1.

¹⁰ See the Wright Declaration at pages 4-5, paragraph E.2, where the actual efficacy for composition F4C (comprising 0.62 wt% a.e. glyphosate and 0.14 wt% a.e. triclopyr) was compared to an expected efficacy calculated from the individual applications of (i) composition F0C (comprising 0.62 wt% a.e. glyphosate in the absence of triclopyr) and composition BBG (comprising 0.18

Dr. Wright further explained that (a) the efficacy data at 5 days after treatment disclosed in Tables 3.2A, 3.2B and 4.4.1 show either synergy or a lack of antagonism, (b) the efficacy data at 14 or 21 days after treatment indicates an essential lack of antagonism on oak at 21 DAT and slight synergy on poison ivy at 14 DAT, (c) the pyridine analog herbicide triclopyr did not reduce long-term glyphosate control of oak plants (i.e., 21 days after treatment), and (d) the highest percent plant control was achieved at ratios of glyphosate to pyridine analog in excess of 6.7:1.¹¹

C. The cited prior art

The cited Hacker, Jimoh and Brigance references have been previously discussed in prosecution of the present application. The teaching of those references is summarized below.

1. Hacker

(i) Hacker discloses a broad range of herbicide combinations

Hacker describes a large number of herbicide combinations for control of harmful plants in herbicide-tolerant oil-seed rape crops. Hacker describes combinations of "Group A" herbicides and "Group B" herbicides wherein columns 5-8 list 15 Group A herbicides (including glyphosate) and 20 Group B herbicides (including clopyralid) representing 17 separate herbicide classes (i.e., genera). From that listing, a total of 150 two component herbicide combinations are possible.¹² Column

wt% a.e. triclopyr in the absence of glyphosate) or (ii) composition RU1 (comprising 0.94 wt% a.e. glyphosate in the absence of triclopyr) and composition BBG.

¹¹ See the Wright Declaration at page 7, paragraphs E.4, E.5 and E.6.

¹² Calculated as number of combinations = total number of permutations/number of permutations of each set. Mathematically: ${}^nC_r = n!/r!(n-r)! = 20*15/2!*1! = 300/2 = 150$ possible combinations of two herbicide compositions.

9, line 46 to column 10, line 3 lists 57 preferred herbicide combinations, while column 10:46-64 list another 40 preferred herbicide combinations selected from a preferred combination of herbicide A1.2 (glufosinate) or A2.2 (glyphosate) in combination with one or more herbicides selected from the groups B1', B2' (including clopyralid), B3' and/or B4'. Hacker at column 10:47-48 discloses that glufosinate is particularly preferred; such a preference for glyphosate, hence combinations of glyphosate and clopyralid, is not disclosed.

(ii) Hacker would not have suggested to one skilled in the herbicide arts that the combination of glyphosate and a pyridine analog herbicide provides lack of antagonism or synergistic herbicidal efficacy

As explained by Dr. Wright, Hacker would not have suggested that the combination of glyphosate and a pyridine analog herbicide as presently claimed is not antagonistic or provides synergistic control of grass plant species.¹³

Dr. Wright explains that Hacker broadly discloses synergy for the combination of 4 different classes of Group A herbicides and 6 different classes of Group B herbicides encompassing over 40 herbicide species and an innumerable number of potential combinations of herbicide species, each of those species having a unique mode of action in plants.¹⁴ In view of common general knowledge in the art as of the present priority date, Dr. Wright states that one skilled in the art would understand that the co-activity between co-formulated herbicides from differing classes is unpredictable, an admission expressly made by Hacker.¹⁵

¹³ See the Wright Declaration at page 2, paragraph B.5.(ii).

¹⁴ See the Wright Declaration at page 11, paragraph F.2(b).

¹⁵ See the Wright Declaration at page 11, paragraph F.2.(b) and Hacker at column 1:45-49 stating "phenomena of physical and biological incompatibility, for example lacking stability of a coformulation, decomposition of an active

In more detail, Dr. Wright explains that it was well known to those skilled in the art as of the 22 April 2003 priority date of the present application that the herbicidal efficacy associated with combinations of herbicide species from two herbicide classes is unpredictable and biological incompatibility frequently occurs.¹⁶ Evidence adduced by Dr. Wright shows that it was known to those skilled in the art that certain herbicides such as auxin herbicides, substituted urea herbicides and phenoxy herbicides are antagonistic to glyphosate and can reduce glyphosate efficacy in herbicide co-formulation compositions.¹⁷ Auxin herbicides include the presently claimed pyridine analog herbicides triclopyr, clopyralid, fluroxypyr and picloram.¹⁸ Substituted urea herbicides include the herbicides dimefuron (referenced as B1.6 by Hacker) and ethametsulfuron-methyl (referenced as B2.4 by Hacker) that are asserted by Hacker at columns 9:65, 9:66-67, and column 11:60-61 as providing a synergistic herbicidal response in combination with glyphosate (referenced as A2 by Hacker); Hacker provides no experimental support for the assertion of synergy of the glyphosate combinations.¹⁹ Phenoxy herbicides include the herbicides quizalofop (referenced as B3.1 by Hacker), fenoxaprop (referenced as B3.1 by Hacker), fluazifop (referenced as B3.3 by Hacker), haloxyfop (referenced as B3.4 by Hacker) and propaquizafop (referenced as B3.5 by Hacker) that are asserted

ingredient or antagonism of the active ingredients, occur not infrequently when using several active ingredients in combination."

¹⁶ See the Wright Declaration at page 9, paragraph F.1.(a).

¹⁷ See the Wright Declaration at page 9, paragraph F.1.(c) and associated Exhibit 2.

¹⁸ See the Wright Declaration at page 10, paragraph F.1.(c)(i) and associated Exhibit 3.

¹⁹ See the Wright Declaration at page 10, paragraph F.1.(c)(ii) and associated Exhibit 3.

by Hacker at columns 7:50 to 8:14 and column 11:60-61 as providing a synergistic herbicidal response in combination with glyphosate (referenced as A2 by Hacker); Hacker provides no experimental support for the assertion of synergy of the glyphosate combinations.²⁰

Dr. Wright notes that Hacker does not present any experimental evidence to support alleged synergy for glyphosate compositions in combination with any coherbicide, much less the selection of glyphosate in combination with a pyridine analog herbicide as is presently claimed.²¹ Hacker does provide experimental evidence in Table 5 at column 20 purporting to show synergy for the combination of glufosinate (a phosphoherbicide, referenced as Active Ingredient A1.2) and clopyralid (a pyridine analog herbicide falling within the scope of the present claims, referenced as Active Ingredient B2.2) at a weight ratio of glufosinate to clopyralid of 2.3:1, but analysis of the results asserted by Hacker to show synergy instead show that (i) no conclusion for the asserted synergistic herbicidal effect of the combination of glufosinate and clopyralid on *Cirsium arvense* (Canada thistle) broadleaf plants can be made and (ii) the combination of glufosinate and clopyralid is antagonistic on *Chenopodium album* (Lambsquarters) broadleaf plants.²²

Hacker discloses that the combination of glufosinate and clopyralid is among the most preferred combinations asserted to provide a synergistic herbicidal response (see column 10:48-49 and column 10:54), but on its face Hacker expressly discloses that said combination is antagonistic. Hacker's examples

²⁰ See the Wright Declaration at page 10, paragraph F.1.(c)(iii) and associated Exhibit 3.

²¹ See the Wright Declaration at page 12, paragraph F.3.(a).

²² See the Wright Declaration at page 12, paragraph F.3.(b) and F.3.(b)(i) and (ii).

therefore expressly contradict his broad assertions of synergy for co-herbicide combinations comprising clopyralid, and teaches away from the present claims in that regard. Clearly, one skilled in the art reading Hacker in view of the common general knowledge as of the priority date explained above would not have been led to believe that the instantly claimed combination of glyphosate and a pyridine analog herbicide is not antagonistic or provides a synergic herbicidal response. Hacker would therefore have led one skilled away from the claimed combination and would not have provided any predictability or reasonable expectation of success for making the presently claimed combination.

(iii) Hacker would not have provided any guidance, suggestion or starting point to one skilled in the art for selection of the narrowly claimed weight ratio range of glyphosate to pyridine analog herbicide of (most broadly) 7:1 to 20:1

Hacker asserts that a weight ratio range of glyphosate to the pyridine analog herbicide clopyralid is very particularly preferably from 60:1 to 1:20. As explained by Dr. Wright, it has been discovered that the herbicidal effect for the combination of glyphosate and a pyridine analog, where the pyridine analog is in weight percent excess over glyphosate, is instead antagonistic.²³ The weight ratio range disclosed by Hacker overlaps with the instantly claimed range and a significant portion of the weight ratio range disclosed by Hacker is unsuitable for the purposes of the present invention. Hacker therefore provides no basis or benchmark from which one skilled in the art would have derived the narrowly claimed range for the purpose of overcoming herbicidal antagonism associated

²³ See the Wright Declaration at page 14, paragraph F.4.(b).

with the combination of glyphosate and pyridine analog herbicides.²⁴

2. Jimoh

Jimoh is generally directed to liquid concentrate herbicidal emulsion compositions comprising a water soluble herbicide in an aqueous carrier phase and an oil soluble herbicide in a discontinuous phase. Jimoh addresses the problem of water-mediated chemical degradation (hydrolysis) of the oil-soluble herbicides, and insulates the oil soluble herbicide from water contact thereby minimizing degradation.

(i) Jimoh discloses a broad range of herbicide combinations

Jimoh provides a broad disclosure of 52 possible water-soluble herbicides including glyphosate and the pyridine analog herbicides picloram, clopyralid and triclopyr. Twenty-two separate water-soluble herbicide genera are disclosed.²⁵ From among the 52 disclosed water soluble herbicides, the combination of glyphosate and picloram, glyphosate and clopyralid and glyphosate and triclopyr are but three out of a possible 1326 combinations of two water-soluble herbicides.

Picloram, clopyralid and triclopyr are not among the water soluble herbicides described in the last two sentences of

²⁴ See the Wright Declaration at pages 14-15, paragraph F.4.(c).

²⁵ (1) nitrophenylether (acifluorfen, fluoroglycofen, fomesafen); (2) unclassified (acrolein, bentazon, endothall, fenac); (3) triazole (amitrole); (4) carbamate (asulam); (5) benzothiazole (benzolin); (6) pyridine analog (clopyralid, triclopyr, picloram); (7) organophosphorus (bialaphos, fosamine, glufosinate, glyphosate); (8) uracil (bromacil); (9) nitrile (bromoxynil, ioxynil); (10) benzoic acid (chloramben, dicamba, 2,3,6-TBA,); (11) halogenated aliphatic (chloroacetic acid, dalapon, flupropanate, TCA); (12) phenoxyacetic (2,4-D, 2,4-DB, MCPA,); (13) phenoxybutyric (MCPB); (14) phenoxy propionic (dichlorprop, mecoprop); (15) pyrazole (difenzoquat); (16) quaternary ammonium (diquat, paraquat); (17) aryloxyphenoxypropionic (fenoxaprop); (18) arylalanine (flamprop); (19) dicarboximide (flumiclorac); (20) imidazolinone (imazamethabenz, imazamox, imazapic, imazapyr, imazaquin, imazethapyr); (21) amide (naptalam) and (22) quinolinecarboxylic acid (quinclorac).

paragraph [0028] as being particularly preferred (i.e., bialaphos, glufosinate, glyphosate and the imidazolinones imazameth, imazamethabenz, imazamox, imazapic, imazapyr, imazaquin and imazethapyr). Nor does Jimoh provide any example for the combination of glyphosate and a pyridine analog herbicide.

Thus, Jimoh does not suggest a preference for the selection of the instantly claimed herbicide combinations from among the 1326 possible combinations encompassed by the broad disclosure. Nor does Jimoh suggest a preference for the selection of the instantly claimed pyridine analog herbicide genus from among the other 21 genera. Jimoh therefore provides no reason for one skilled in the art to select the narrow specific combination of glyphosate and picloram, clopyralid or triclopyr from among the innumerable possible combinations of water soluble herbicides.

Jimoh further provides a broad disclosure of 192 oil soluble herbicides including dithiopyr and thiazopyr. That disclosure includes a large number of genera of water-insoluble herbicides. From among the list of 9 preferred water-soluble herbicides (including glyphosate) disclosed at paragraph [0028] as being particularly preferred, the combination of glyphosate and dithiopyr or glyphosate and thiazopyr are but two out of 1719 possible combinations of a water-soluble and water-insoluble pesticide. Nor does Jimoh provide any example for the combination of glyphosate and a pyridine analog herbicide. Jimoh therefore provides no reason for one skilled in the art to select the narrow specific combination of glyphosate and a pyridine analog from among the innumerable possible combinations of water soluble herbicides and water insoluble herbicides.

(ii) Jimoh does not recognize the problem of antagonism between glyphosate and pyridine analog herbicides

Jimoh is directed to compositions formulated to prevent oil soluble herbicide degradation during storage; Jimoh says nothing about the effect of the co-herbicides on plants. Jimoh specification does not recognize the present antagonism problem, nor in any way suggest that the weight ratio of glyphosate to any co-herbicide, much less pyridine analog herbicides, overcomes antagonism in order to achieve both short-term and long-term plant control. Jimoh's examples are also silent regarding synergy or lack of antagonism. A combination of glyphosate and carfentrazone-ethyl (not a pyridine analog herbicide) was evaluated on plants (see Example 12), but those herbicides were not evaluated individually. Therefore, an expected efficacy against which synergy or antagonism could be measured cannot be calculated. Consequently, Jimoh's disclosure fails to describe or suggest synergy, preventing antagonism between glyphosate and a pyridine analog as instantly claimed, or that said compositions could achieve both early plant control symptomology and long term plant control.

(iii) Jimoh would not have suggested to one skilled in the herbicide arts that the combination of glyphosate and a pyridine analog herbicide provide lack of antagonism or synergistic herbicidal efficacy

As explained above, it was well known to those skilled in the art as of the 22 April 2003 priority date of the present application that pyridine analog herbicides may be antagonistic to glyphosate and can reduce glyphosate efficacy in herbicide co-formulation compositions.

Jimoh expressly teaches away from combining glyphosate and an oil soluble herbicide as instantly claimed because he teaches

that the oil soluble herbicide degrades in the presence of water unless formulated as an emulsion to protect the oil soluble herbicide.²⁶

Jimoh is silent regarding the effect of the co-herbicides on plants. The Jimoh specification does not recognize the present antagonism problem, nor in any way suggest that the weight ratio of glyphosate to any co-herbicide, much less pyridine analog herbicides, overcomes antagonism in order to achieve both short-term and long-term plant control. Jimoh's examples are also silent regarding synergy or lack of antagonism. A combination of glyphosate and carfentrazone-ethyl (not a pyridine analog herbicide) was evaluated on plants (see Example 12), but those herbicides were not evaluated individually. Therefore, an expected efficacy against which synergy or antagonism could be measured cannot be calculated. Consequently, Jimoh's disclosure fails to describe or suggest synergy, preventing antagonism between glyphosate and a pyridine analog as instantly claimed, or that said compositions could achieve both early plant control symptomology and long term plant control.

- (iv) Jimoh would not have provided any guidance, suggestion or starting point to one skilled in the art for selection of the narrowly claimed weight ratio range of glyphosate to pyridine analog herbicide of (most broadly) 7:1 to 20:1**

Jimoh attached no importance to the co-herbicide weight ratio. Jimoh broadly describes a weight ratio of water-soluble herbicide to oil-soluble herbicide of 1:1 to 190:1, and preferably 19:1 to 190:1 for some oil soluble herbicides (see Jimoh at paragraph [0038]). Looking to the examples for

²⁶ See Jimoh paragraphs [0006], [0008], [0009], [0011], [0012], [0016], [0049], [0050], [0052] and Example 11.

guidance, each exemplified composition is formulated at a ratio of glyphosate to carfentrazone-ethyl of about 190:1²⁷. Because Jimoh is concerned with forming emulsions containing the oil soluble herbicides in a discontinuous phase thereby isolating it from the aqueous carrier phase for the purpose of preventing degradation, one skilled in the art would assume that low oil soluble herbicide concentrations (i.e. a high ratio of water-soluble herbicide to oil soluble herbicide) would be preferred in order to both limit the solvent content and most effectively isolate the oil soluble herbicide from the aqueous phase, while at the same time maximizing the proportion of the aqueous carrier phase in order to provide high glyphosate concentration.

In view of Jimoh, one skilled in the art would have had no reason to limit the weight ratio of glyphosate to pyridine analog to, most broadly, 7:1 to about 20:1 for the purpose of avoiding antagonism with any expectation of success.

3. Brigance

Brigance is directed to the problem of eye-irritation associated with certain surfactants used in pesticide compositions. Brigance solves the problem by formulating the pesticide with a mixture of a polyoxyalkylene aliphatic amine surfactant, a mixture of polyhydric alcohols and a metal-complexing carboxylic acid.

(i) Brigance discloses a broad range of herbicide combinations

Brigance at paragraph [0018] describes 17 exemplary herbicides including glyphosate and picloram resulting in 136 possible combinations of herbicides. Of those herbicides, only

²⁷ Each example contains about 42 wt% IPA glyphosate (which is equivalent to about 31 wt% a.e. glyphosate) and about 0.18. wt% of 91.2% carfentrazone-ethyl (which is equivalent to about 0.164 wt%). A ratio of about 190:1 is calculated by (31)/(0.164).

glyphosate is described as preferred; no preference for picloram or a mixture of picloram and glyphosate is described or suggested. Thus the instantly claimed combinations are not among Brigance's preferred embodiments.

(ii) Brigance would not have suggested to one skilled in the herbicide arts that the combination of glyphosate and a pyridine analog herbicide provide lack of antagonism or synergistic herbicidal efficacy

Brigance does not recognize that co-formulations of glyphosate and pyridine analog herbicides can be antagonistic when the pyridine analog herbicide is in weight percent excess, nor does Brigance even remotely suggest combining glyphosate and pyridine analog herbicides for the purpose of obtaining both early symptoms of plant treatment that are associated with the pyridine analog herbicide and prolonged control of the plant associated with glyphosate.

Brigance's examples are directed solely to glyphosate and therefore provide no guidance regarding glyphosate and pyridine analog herbicide combinations, such as a synergistic effect.

(iii) Brigance would not have provided any guidance, suggestion or starting point to one skilled in the art for selection of the narrowly claimed weight ratio range of glyphosate to pyridine analog herbicide of (most broadly) 7:1 to 20:1

The claim element directed to the weight ratio of glyphosate to pyridine analog is missing from Brigance. Brigance therefore does not teach, suggest or attach any importance to weight ratios between co-herbicides, much less the selection of glyphosate and picloram (or any pyridine analog herbicide) wherein glyphosate is in excess on a weight percent a.e. basis.

D. The pending claims are non-obvious over Hacker in combination with Brigance and Jimoh

Applicants respectfully submit that the Office has failed to establish a *prima facie* case of obviousness, and claims 29-32, 36-39, 43, 44, 46-53, 59, 62, 63 and 66, are non-obvious over Hacker in combination with Brigance and Jimoh.

1. The legal standard for establishing a *prima facie* case of obviousness

In response to the decision in *KSR International Co. v. Teleflex Inc.*,²⁸ the USPTO issued new guidelines for examiners regarding the obviousness standard (72 Fed. Reg. 57526-35, 10/10/07) and revised MPEP §2141.III to articulate rationales to support rejections under 35 USC §103. The USPTO recently issued guidelines updating the obviousness analysis in view of post-*KSR* case law (75 Fed. Reg. 53643-660, 9/1/10). As detailed therein, in addition to the teaching-suggestion-motivation test, six other rationales for establishing a *prima facie* case of obviousness are indicated as follows: (1) Combining prior art elements according to known methods to yield **predictable results**; (2) Simple substitution of one known element for another to obtain **predictable results**; (3) Use of known technique to improve similar devices (methods or products) in the same way; (4) Applying a known technique to a known device (method or product) ready for improvement to yield **predictable results**; (5) "Obvious to try" - choosing from a finite number of identified, **predictable solutions, with a reasonable expectation of success**; and (5) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces

²⁸ *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1739 (2007), 82 USPQ2d 1385 (2007).

if the variations are **predictable** to one of ordinary skill in the art (emphasis added).²⁹ In view of the above, the guidelines supporting an obviousness rejection under 35 USC §103 may be summarized into three basic concepts (1) predictable results; (2) obvious to try; and (3) teaching, suggestion, or motivation to combine references.

In view of the MPEP and KSR, it is clear that, to establish a *prima facie* case of obviousness, the Office must (1) show that each claimed element is described in the prior art; (2) show a reason to combine the prior art elements to produce the claimed invention; and (3) show a reasonable expectation of success and at least some degree of predictability.

2. **In view of Hacker, Jimoh, Brigance, and the state of the art as of the present priority date, one skilled in the art would not have predicted that the narrow selection of the claimed combination of glyphosate and a pyridine analog herbicide would control plants in the absence of herbicidal antagonism or with a synergistic herbicidal response**

Post KSR decisions have clarified the predictability standard. In particular, the predictable result discussed in KSR refers not only to the expectation that prior art elements are capable of being physically combined, but also that the combination would have worked for its intended purpose. *DePuy Spine, Inc. V. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1326 (Fed. Cir. 2009).³⁰ Further, an inference that a claimed combination would not have been obvious is especially strong where the prior art's teachings undermine the very reason being proffered as to why a person of ordinary skill would have

²⁹ 75 Fed. Reg. at 53643.

³⁰ Quoting Fed. Ref. Vol. 75, 53649 at column 1, 3rd full paragraph.

combined the known elements.³¹ Still further, even if there are a finite number of identified solutions, an invention cannot be obvious to try unless the identified solutions are also predictable. *Bayer Schering Pharma AG v. Barr Labs, Inc.*, 575 F.3d 1341, 1347 (Fed. Cir. 2009).³²

Applicants respectfully submit that the Office has failed to show a reasonable expectation of success and at least some degree of predictability in view of the Hacker, Jimoh and Brigance disclosures.

Hacker teaches away from the present invention. As explained in detail above, it was known to those skilled in the art as of the present priority date, and expressly acknowledged by Hacker, that herbicidal efficacy associated with combinations of herbicide species from two herbicide classes (e.g., glyphosate and a pyridine analog) is unpredictable and biological incompatibility frequently occurs. As explained by Dr. Wright, it was further known to those skilled in the art that auxin herbicides such as the triclopyr, clopyralid, fluroxypyr and picloram can reduce glyphosate efficacy in herbicide co-formulation compositions. Hacker broadly asserts synergy for 150 two component herbicide combinations representing 17 herbicide classes, yet provides a limited set of working examples directed to glufosinate combinations purporting to demonstrate synergy. Hacker asserts that the particularly preferred combination of the phosphoherbicide glufosinate and the pyridine analog herbicide clopyralid is synergistic, but experimental evidence expressly contradicts that assertion and

³¹ *Id.*

³² See also MPEP §2143 A(3) stating "if results would not have been predictable, Office personnel should not enter an obviousness rejection using the combination of prior art elements rationale, and should withdraw such a rejection if it has been made." Quoting Fed. Ref. Vol. 75, 53647 at column 3, 1st full paragraph.

instead teaches that said combination is antagonistic. Hacker's express teaching therefore undermines the reason proffered by the Office as to why one skilled in the art would look to Hacker for teaching regarding a synergistic response between the claimed glyphosate and pyridine analog co-herbicides (see *DePuy Spine*).

Jimoh expressly teaches away from combining glyphosate and an oil soluble herbicide as instantly claimed because he teaches that the oil soluble herbicide degrades in the presence of water unless formulated as an emulsion to protect the oil soluble herbicide. Jimoh is silent regarding the effect of the co-herbicides on plants and does not recognize the present antagonism problem, nor in any way suggest that the weight ratio of glyphosate to any co-herbicide, much less pyridine analog herbicides, can achieve both short-term and long-term plant control in the absence of antagonism. Consequently, Jimoh's disclosure fails to describe or suggest synergy, preventing antagonism between glyphosate and a pyridine analog as instantly claimed, or that said compositions could achieve both early plant control symptomology and long term plant control.

While the present independent claims 29, 46 and 62 do not exclude the presence of an organic solvent, the claimed combination provides the combination of early burndown and long term control in the absence of antagonism without the necessity of such organic solvents. It thus provides the option of dispensing with the organic solvent thereby obviating the problems created by the presence of such organic solvents such as cost, toxicity, and environmental issues. Nonetheless, applicants have added dependent claims limiting the compositions of those claims to compositions (application mixtures) containing no effective amount of an organic solvent.

Jimoh, like Hacker, discloses an innumerable number of possible herbicide combinations. Jimoh discloses 1326 possible combinations of two water-soluble herbicides representing 21 herbicide classes. Jimoh further discloses 1719 possible combinations of a water-soluble and a water-insoluble herbicide representing numerous herbicide classes. Glyphosate and a pyridine analog are nowhere described as a preferred combination and no working examples for that combination are provided.

Brigance does not recognize that co-formulations of glyphosate and pyridine analog herbicides can be antagonistic when the pyridine analog herbicide is in weight percent excess, nor does Brigance even remotely suggest combining glyphosate and pyridine analog herbicides for the purpose of obtaining both early symptoms of plant treatment that are associated with the pyridine analog herbicide and prolonged control of the plant associated with glyphosate.

Brigance's examples are directed solely to glyphosate and therefore provide no guidance regarding glyphosate and pyridine analog herbicide combinations, such as a synergistic effect.

Finally, Brigance discloses 136 possible herbicide combinations and is similar to Hacker and Jimoh in that regard. Of those herbicides, only glyphosate is described as preferred; no preference for picloram or a mixture of picloram and glyphosate is described or suggested. Thus the instantly claimed combinations are not among Brigance's preferred embodiments.

In view of Hacker, Jimoh and the state of the art as of the present priority date, one skilled in the art would have been led to believe, and would have predicted, that the presently claimed combination would result in herbicidal antagonism and said combination would not have worked for its intended purpose

of achieving both early symptoms of plant treatment that are associated with the pyridine analog herbicide and prolonged control of the plant associated with glyphosate in the absence of antagonism or with a synergistic herbicidal response; Hacker and Jimoh both teach away from such a result. Brigance is silent regarding synergism or antagonism and would not have overcome the deficiencies of Hacker and Jimoh.

The applicants have demonstrated more than predictable results. As explained in the Declaration of Dr. Wright, it is surprising and unexpected that the narrowly selected and claimed glyphosate to pyridine analog ratio of 7.6:1 to 20:1 as required by claim 29, 7:1 to 20:1 as required, most broadly, by claim 46, or 8:1 to 20:1 as required by claim 62 would overcome the antagonism associated with and inherent in compositions having pyridine analog herbicides in weight percent excess over glyphosate.³³ As held in *Crocs, Inc. v. U.S. International Trade Commission*³⁴, a claimed combination may be non-obvious where the prior art teaches away from the claimed combination and the combination yields more than predictable results.³⁵

Therefore, one skilled in the art would not have had a reason to combine Hacker, Jimoh and Brigance to produce the claimed invention with a reasonable expectation of success and at least some degree of predictability.

3. Hacker, Jimoh and Brigance would not have suggested the instantly claimed ratio of glyphosate herbicide to pyridine analog herbicide

Hacker teaches that a weight ratio range of glyphosate to the pyridine analog herbicide clopyralid is very particularly

³³ See the Wright Declaration at pages 3-8, Section E.

³⁴ *Crocs, Inc. v. U.S. International Trade Commission*, 598 F.3d 1294 (Fed. Cir. 2010),

³⁵ See 75 Fed. Reg. at 53647 at column 1, 2nd full paragraph.

preferably from 60:1 to 1:20. As explained by Dr. Wright above, glyphosate to pyridine analog herbicide ratios of 1:1 to 1:20 result in an antagonistic herbicidal response. Therefore, a significant portion of the range disclosed by Hacker is inoperable for the instantly claimed purpose. Moreover, Hacker teaches away from the claimed combination, regardless of any ratio. Further, only the present applicants have discovered the greatest plant control is achieved when the weight ratio of glyphosate to pyridine analog exceeds 6.7:1. Hacker therefore would not have provided any motivation for one skilled in the art to select the instantly claimed herbicide ratio of, most broadly, 7:1 to 20:1 with any expectation of success.

Jimoh, teaches away from the present invention and suggests a preferred weight ratio of glyphosate to co-herbicide of 19:1 to 190:1, and only when the co-herbicides are formulated with an organic solvent to serve as a barrier layer to prevent herbicide degradation. Jimoh therefore does not overcome the deficiencies of Hacker and would not have provided any motivation for one skilled in the art to select the instantly claimed herbicide ratio of, most broadly, 7:1 to 20:1 with any expectation of success.

Brigance is silent as to any ratio and does not overcome the deficiencies of Hacker and Jimoh.

Therefore Hacker, Jimoh and Brigance would not have suggested the instantly claimed ratio of glyphosate herbicide to pyridine analog herbicide to achieve the objects of the present claims.

4. Hacker, Jimoh and Brigance would not have lead one skilled in the art to make the dual selection of (i) glyphosate and a pyridine analog herbicide at (ii) a weight ratio of, most broadly, at least 7.6:1 to 20:1

As explained above, the cited art teaches away from the claimed combination of glyphosate and a pyridine analog herbicide, provides no reason to select the combination of glyphosate and a pyridine analog herbicide from the innumerable number of possible herbicide combinations to arrive at the claimed invention, and provides no reasonable expectation of success and at least some degree of predictability for the claimed combination of herbicides. The prior art further would not have suggested the instantly claimed ratio of glyphosate herbicide to pyridine analog herbicide for the purpose of obtaining both early symptoms of plant treatment that are associated with the pyridine analog herbicide and prolonged control of the plant associated with glyphosate in the absence of herbicidal antagonism. One skilled in the art therefore would not have had any reason to make the instantly claimed dual selection of (i) glyphosate and a pyridine analog (ii) at the claimed weight ratio with a reasonable expectation of success.

5. Inherency cannot serve as the basis for an obviousness rejection

The Office asserts that the compositions taught by Hacker (and Jimoh and Brigance) "comprise the same components as instantly claimed and would thus inherently overcome glyphosate-pyridine analog antagonism to achieve both early plant control symptomology and long term plant control." However, well established case law holds that inherency and obviousness are distinct concepts, and inherency cannot serve as the basis for

an obviousness rejection.³⁶ As stated in *Spormann*, "what is unknown cannot be obvious." Therefore the claims cannot be obvious over Hacker under the doctrine of inherency.

6. Claims 29-32, 36-39, 43, 44, 46-53, 59, 62 and 65 are non-obvious under 35 USC §103(a) over Hacker, Jimoh and Brigance

Applicants respectfully submit that the combination of Hacker, Jimoh and Brigance (i) would not have enabled one skilled in the art to predict that the narrow selection of the claimed combination of glyphosate and a pyridine analog herbicide would control plants in the absence of herbicidal antagonism or with a synergistic herbicidal response, (ii) would not have provided one skilled in the art with a reason to make said selection with any expectation of success in view of the breadth of the prior art disclosure and express teaching away and (iii) would not have suggested the instantly claimed ratio of glyphosate herbicide to pyridine analog herbicide.

The Office has therefore failed to establish a prima facie case of obviousness and claims 29-32, 36-39, 43, 44, 46-53, 59, 62 and 65 are patentable under 35 USC §103(a) over Hacker in combination with Jimoh and Brigance.

7. New claims 68-70 are non-obvious over the combination of Hacker, Jimoh and Brigance

New claims 68-70 depend from claims 29, 46 and 62, respectively, and further specify that the compositions of those

³⁶ Inherency and obviousness are different concepts and "[o]bviousness cannot be predicated on what is not known at the time an invention is made, even if the inherency of a certain feature is later established." MPEP §2141.02.V citing *In re Rijckaert*, 9 F.2d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993). See also *In re Shetty*, 566 F.2d 81, 86, 195 USPQ 753, 756 ("inherency is quite immaterial if ...one of ordinary skill in the art would not appreciate or recognize that inherent result.") and *In re Spormann*, 363 F.2d 444, 448, 150 USPQ 449, 452 ("the inherency of an advantage and its obviousness are entirely different questions. That which may be inherent is not necessarily known. Obviousness cannot be predicated on what is unknown.").

claims contain no effective amount of an organic solvent. Jimoh would not have provided one skilled in the art with a reason to formulate glyphosate and a pyridine analog herbicide in compositions containing no effective amount of organic solvent. Jimoh teaches away from such a combination. Claims 68-70 are therefore non-obvious over Hacker, Jimoh and Brigance for the reasons explained above.

IV. Conclusion

Applicants respectfully submit that claims 29-32, 36-39, 43, 44, 46-53, 59, 62, 63, 66 and new claims 68-70, are nonobvious under 35 USC §103(a) over Hacker, Jimoh and Brigance. Withdrawal of the rejection and allowance of the claims is respectfully requested.

* * * * *

The Commissioner is hereby authorized to charge any underpayment and/or credit any overpayment of government fees in connection with this response to Deposit Account No. 19-1345.

Respectfully submitted,

/James D. Harper/

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